## (12) INTERNATIONAL APE

#### TION PUBLISHED UNDER THE PATENT CO



## (19) World Intellectual Property Organization

International Bureau



## - 1 (1888 CHINEDE IN COLURE ATHE COLUR COLUR

(43) International Publication Date 31 December 2003 (31.12,2003)

PCT

# (10) International Publication Number WO 2004/000895 A 1

(51) International Patent Classification<sup>7</sup>: 2/06, 2/42

C08F 10/08,

(21) International Application Number:

PCT/EP2003/006348

(22) International Filing Date: 17 June 2003 (17.06.2003)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

02077543.3 60/408,196 24 June 2002 (24.06.2002) EP 4 September 2002 (04.09.2002) US

(71) Applicant (for all designated States except US): BASELL POLIOLEFINE ITALIA S.P.A [IT/IT]; Via Pergolesi, 25, 20124 Milano (IT).

(72) Inventors; and

(75) Inventors/Applicants (for US only): BIGIAVI, Daniele [IT/IT]; Via G. Rocchi, 2, I-40137 Bologna (IT). MEI, Gabriele [IT/IT]; Via Beata Lucia da Narni, 3, I-44100 Ferrrara (IT). ARICH DE FINETTI, Nicolò [IT/IT]; Via Borgoleoni, 108, I-44100 Ferrara (IT). PENZO, Giuseppe [IT/IT]; Via Segantini, 16, Montanara di Curtatone, I-46010 Mantova (IT). VITALE, Gianni [IT/IT]; Via Fulvio Testi, 22, I-44100 Ferrara (IT). COVEZZI, Massimo [IT/IT]; Via Renata di Francia, 40, I-44100 Ferrara (IT).

- (74) Agent: COLUCCI, Gluseppe; Basell Poliolefine Italia S.p.A., Intellectual Property, P.le G. Donegani, 12, I-44100 Ferrara (IT).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

#### **Declaration under Rule 4.17:**

of inventorship (Rule 4.17(iv)) for US only

#### Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: LIQUID PHASE PROCESS FOR THE POLYMERIZATION OF ALPHA-OLEFINS

(57) Abstract: A liquid-phase process for polymerizing  $\alpha$ -olefins of the formula CH<sub>2</sub>=CHR, where R is H or an alkyl radical C1-C6, to produce a polymer that is soluble in the reaction medium, comprising the steps of: a) continuously polymerizing in liquid phase the  $\alpha$ - olefin in the presence of a catalyst system based on a transition metal compound; b) continuously withdrawing from step a) a solution of polymer in the liquid reaction medium; c) mixing in one or more mixing stages said solution of polymer in the reaction medium with an organic deactivator having: at least a hydroxy group, a boiling point higher than 150°C, and a ratio between the molecular weight (MW) and the number of hydroxy groups (OH) comprised between 20 and 100.

## INTERNATIONAL SEARCH REPORT

Internal Application No PCT/ 3/06348

	~				
<b>A</b> . I	LLASSIFI	CATION	OF SUBJEC	T MATTED	
	<u> </u>	07.1.0.1	o. opcoro		-
TD	rz		3 A / A A	~~~	. ~ / ~ ~
ΙP	, ,	1 1126	10/08	1.110	2/06

C08F2/42

According to International Patent Classification (IPC) or to both national classification and IPC

#### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  $IPC \ 7 \ C08F$ 

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal

C. DOCUM	INTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	
X	US 5 747 612 A (MUHLE MICHAEL ELROY ET AL) 5 May 1998 (1998-05-05)	1	
Υ	column 5, line 31 — line 44; claims; example 1	1-9	
Y	US 4 701 489 A (PELLON BRIAN J ET AL) 20 October 1987 (1987-10-20) cited in the application claims	1-9	
Y	EP 0 449 519 A (SHELL OIL CO) 2 October 1991 (1991-10-02) page 5, line 38 - line 39; claims	1-9	
Υ	EP 0 172 961 A (MITSUI PETROCHEMICAL IND) 5 March 1986 (1986-03-05) page 12, line 17 - line 31 page 21, line 30; claims; examples	1-9	
	<b>-/</b>	1	

	<del></del>
Special categories of cited documents:	"T" later document published after the international filing date
"A" document defining the general state of the art which is not considered to be of particular relevance	or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier document but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to
"L" document which may throw doubts on priority claim(s) or which is clied to establish the publication date of creater	involve an inventive step when the document is taken alone
which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention
*O* document referring to an oral disclosure, use, exhibition or other means	cannot be considered to involve an inventive step when the document is combined with one or more other such docu- ments, such combination being obvious to a person skilled
"P" document published prior to the international filing date but	In the art.
later than the priority date claimed	"&" document member of the same patent family
Date of the actual completion of the international search	Date of mailing of the international search report
29 October 2003	06/11/2003
Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk	
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Kaumann, E
Form PCT/ISA/210 (second sheet) ( July 1992)	

## INTENATIONAL SEARCH REPORT

Internat Application No PCT/E 8/06348

		PCT/B 8/06348				
	C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT					
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.				
A	DE 16 45 282 A (MOBIL OIL CORP) 16 July 1970 (1970-07-16) page 14, line 7 - line 10; claims	1-23				
A	DE 14 95 070 A (ALLIED CHEM) 16 October 1969 (1969-10-16) claims	1–23				
Y	claims  EP 0 225 099 A (CHISSO CORP)  10 June 1987 (1987-06-10) cited in the application claims	1-9				

## INTERNATIONAL SEARCH REPORT

patent family members

Internation Application No
PCT/L 3/06348

Patent document cited in search report		Publication date		Patent family	Publication
· · · · · · · · · · · · · · · · · · ·				member(s)	date
US 5747612	Α	05-05-1998	US	5442019 A	15-08-1995
			CA	2186400 A1	05-10-1995
			CN	1157000 A	13-08-1997
			DE	69501888 D1	30-04-1998
			DE		
				69501888 T2	12-11-1998
			EP	0751965 A1	08-01-1997
			ES	2118585 T3	16-09-1998
			JP	2858957 B2	17-02-1999
			JP	9511006 T	04-11-1997
			WO	9526370 A1	05-10-1995
			US	5753786 A	19-05-1998
			US	5672665 A	30-09-1997
				5072005 A	30-09-1997 
US 4701489	Α	20-10-1987	AT	91288 T	15-07-1993
			ΑU	603583 B2	22-11-1990
			AU	7417087 A	10-03-1988
			CA	1312406 C	05-01-1993
			CN		
				87106011 A ,B	06-07-1988
			DE	3786433 D1	12-08-1993
			DE	3786433 T2	28-10-1993
			EP	0259965 A2	16-03-1988
			ES	2056823 T3	16-10-1994
			JP	2074509 C	25-07-1996
			ĴΡ	7110887 B	29-11-1995
			JP	63069802 A	
					29-03-1988
			KR 	9506124 B1	09-06-1995
EP 0449519	Α	02-10-1991	US	5118757 A	02-06-1992
- · · <del>-</del>	- •		AT	137769 T	15-05-1996
			CA	2038974 A1	27-09-1991
					_
			DE	69119285 D1	13-06-1996
			DE	69119285 T2	19-09-1996
			EP	0449519 A2	02-10-1991
			ES	2090241 T3	16-10-1996
			GR	3020679 T3	31-10-1996
			JP	5214007 A	24-08-1993
EP 0172961	———— А	05-03-1986	 ЕР	0172961 A1	05_02_1006
r: 01/2301	^	00-00-1200			05-03-1986
			AT	38044 T	15-11-1988
			DE	3474673 D1	24-11-1988
DE 1645282	A	16-07-1970	 US	3362943 A	09-01-1968
			BE	665478 A	15-12-1965
			CH ·	456960 A	31-05-1968
			DE	1645282 A1	16-07-1970
			FR	1438707 A	13-05-1966
			GB	1051679 A	
			JP	50015830 B	07-06-1975
			NL	6507563 A ,B	16-12-1965
DE 1405070		16 10 1000		2256666	OF 10 100
DE 1495070	Α	16-10-1969	US	3356666 A	05-12-1967
			BE	652381 A	01-03-1965
			DE	1495070 A1	16-10-1969
			FR	1437392 A	06-05-1966
			GB	1025533 A	14-04-1966
			NL	6409895 A	01-03-1965
EP 0225099	Α	10-06-1987	JP	1658346 C	21-04-1992

# INTENATIONAL SEARCH REPORT

information on patent family members

Internation Application No PCT/E 3/06348

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 0225099	A		JP JP CA CZ DE EP SK US	3023090 B 62116618 A 1287933 C 8608295 A3 3683466 D1 0225099 A2 829586 A3 4771103 A	28-03-1991 28-05-1987 20-08-1991 15-12-1994 27-02-1992 10-06-1987 10-09-1997 13-09-1988